

## FOOD SECURITY AS A WICKED PROBLEM AND THE ROLE OF CITIES

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The food sector requires a conducive climate to sustain agricultural productivity growth. In the case of rice as a staple in Asia, for instance, rice production will need to grow by 25% towards 2050 to meet growing demand; but, yields are expected to fall by 10% owing to climate change (Figure 1). Yet at the same time, food is a significant contributor to carbon (CO<sub>2</sub>) emissions, which have been linked to climate change. Rice growing contributes 1.5% of global greenhouse gas emissions and 12% of methane emissions, and also utilises a third of the world's developed freshwater available.

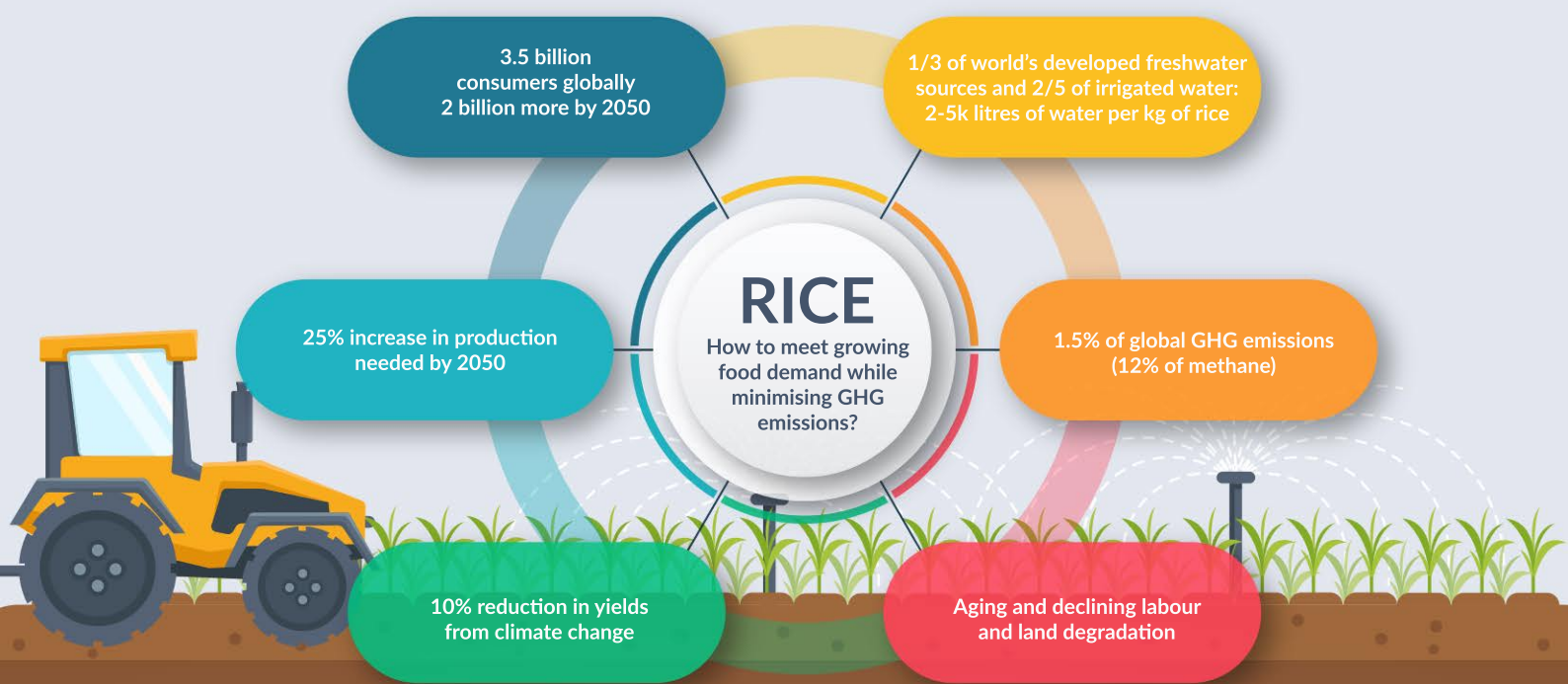


Figure 1: Global context: Agriculture and food security as “wicked problem”

**Source:** Compiled from Paul S. Teng and Jose Ma. Luis Montesclaros. 2023. “Rice Production as a Wicked Problem.” NTS Insight, No. IN23-03. Singapore: RSIS Centre for Non-Traditional Security Studies (NTS Centre), Nanyang Technological University Singapore.

Addressing this “wicked problem” therefore requires multiple interventions, both in adapting the agricultural sector to changing climates, and also in reducing its contributions to carbon emissions. With cities contributing 70% of total food consumption, it is worth considering how cities can reduce their contributions to carbon emissions. Figure 1 shows that the average food consumption per capita in Singapore, on an annual basis, contributes 954 thousand kilograms of CO<sub>2</sub>, approximately 135 thousand litres of water, and more than 4,000 kilowatt hours per capita. The question that remains is how to identify the optimal sustainable “food consumption mix” which improves the quality of food consumed while mimimising its environmental impacts as shown in Figure 2.

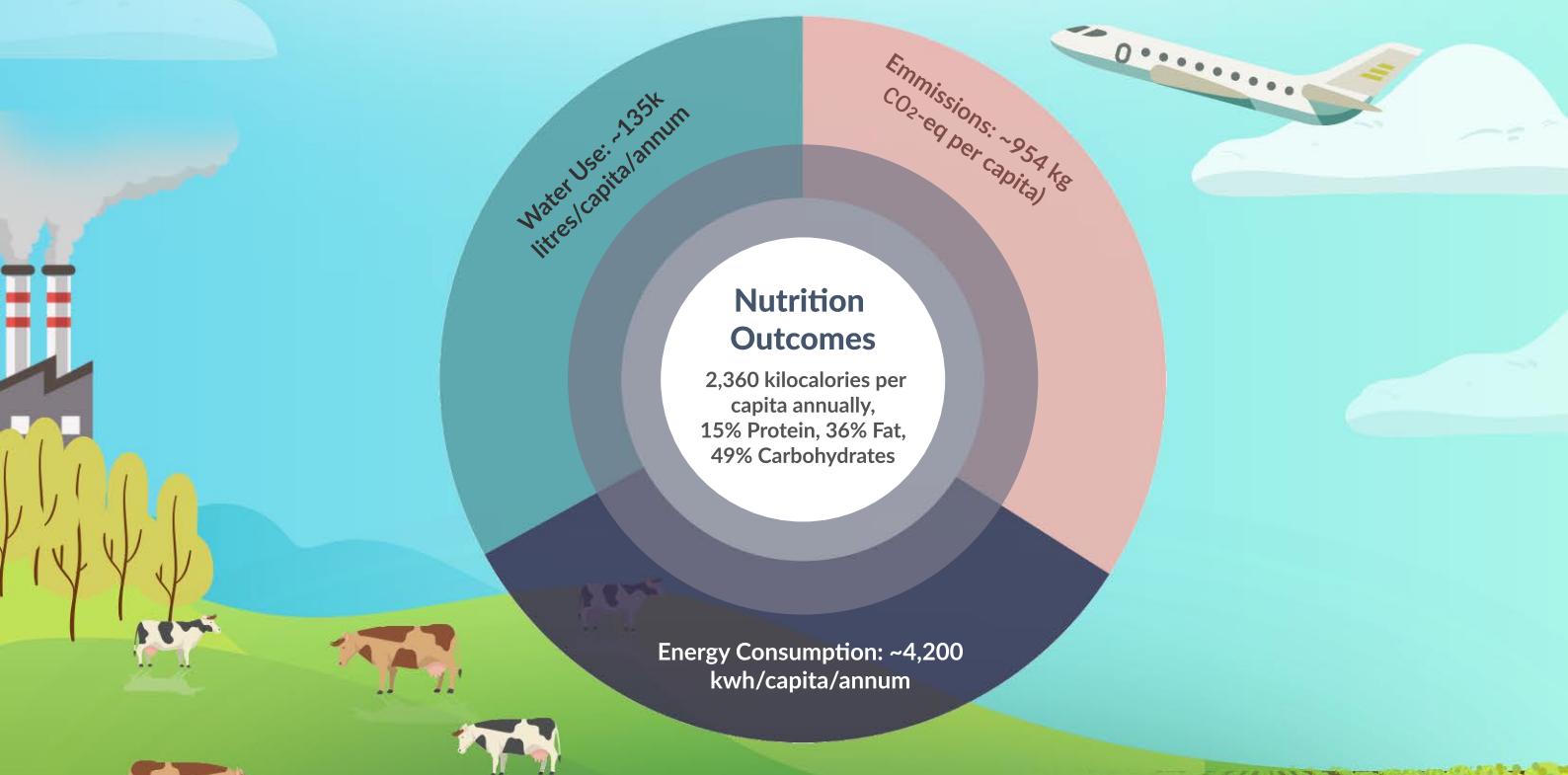


Figure 2: Singapore’s Food Nutrition Outcomes, and food-related Carbon Emissions, and Water and Energy Use

**Source:** Compiled from 1) Emissions, water and energy-use data: Temasek Ecosperity, Deloitte and ASTAR. 2019. “Environmental Impact Of Food In Singapore.” Temasek Ecosperity Website, October, <https://shorturl.at/dlM13>, accessed 21 March 2024, and 2) Nutrition data in 2019 from Research and Development, Health Promotion Board, Singapore. 2022. “National Nutrition Health Survey.” HPB Website, Accessed <https://www.hpb.gov.sg/docs/default-source/pdf/nns-2022-report.pdf> accessed 21 March 2024.